

Mandana Veisheh

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EDUCATION

2000-04 Ph.D., Biomaterials and Nanotechnology

Dept. of Materials Science and Engineering, University of Washington, Seattle, WA

Thesis: “Protein and Cell Patterning for Cell-based Biosensor Applications”

Thesis advisor: Miqin Zhang

Short abstract: Developed novel techniques to pattern multiple and/or single cells with high precision, selectivity, reproducibility, and long-term biostability on various Au-SiO₂ substrates. The developed technology was combined with synchrotron-FTIR spectromicroscopy to study bacterial detection by single macrophage cells.

1996-98 M.Sc., Fiber Sciences and Textile Chemistry Engineering

Dept. of Textile Engineering, Isfahan University of Technology, Iran

Thesis: “Application of Neural Networks in Color Matching of Fluorescent Samples”

1991-95 B.Sc., Fiber Sciences and Textile Chemistry Engineering

Dept. of Textile Engineering, Amirkabir University of Technology (Tehran Polytechnic), Iran

Thesis: “Dyeing of Protein Fibers with Reactive Dyes and Studying the Effect of Albegal-B”

HONORS AND AWARDS

- 2004** Outstanding Graduate Award, Society of Women Engineers
- 2003** Advanced Light Source Doctoral Fellowship, Lawrence Berkeley National Lab
- 2003** Departmental Travel Support, Materials Science and Engineering Department
- 2003** L&K Marsh Fellowship, University of Washington College of Engineering
- 2002** All American Scholar Award, United States Achievement Academy
- 1998** Graduate honors award: ranked first in class of 1998 (M.Sc.)
- 1995** Undergraduate honors award: ranked first in class of 1995 (B.Sc.)

RESEARCH EXPERIENCE

2003-04 Lawrence Berkeley National Lab, Advanced Light Source Division, Berkeley, CA

- Combining a new single-cell patterning technology with synchrotron FTIR spectromicroscopy to detect the *in situ* and *ex situ* responses of macrophage cells to bacterial lipopolysaccharide.
- Characterizing the response of rat glial tumor cells to Etoposide drug using conventional and synchrotron FTIR spectromicroscopy.
- Performing grazing-angle reflectance IR spectroscopy on modified gold substrates.

2000-04 Engineered Biomaterials Center (UWEB) and Dept. of Materials Science and Engineering, University of Washington, Seattle, WA

- Bio-MEMS: Developed a new protein and cell micro-patterning technique on Au/SiO₂ substrates for cell-based biosensors and Bio-MEMS applications.

- **Single-cell-patterning:** Investigated the role of short peptides in single-cell-patterning and introduced a new engineered peptide capable of forming uniform arrays of single-endothelial cells.
- **Biocompatibility:**
 - Designed and conducted experiments for synthesis of polyethylene glycols (PEGs) with different functional groups and chain lengths on various types of SiO₂ substrates.
 - Introduced a new surface treatment protocol to improve the long-term biocompatibility via modulating the silicon oxide state of the substrates.
- **Hemocompatibility:**
 - Developed uniformly covered arrays of human umbilical cord vein endothelial cells (HUVCEs) on Au-SiO₂ platforms using a new covalently bound short peptide on gold regions and a PEG-silane monolayer on silicon background.
 - Performed hemocompatibility tests on the developed platforms using human blood platelets.
- **Molecular Engineering:**
 - Engineered Au, SiO₂, Au-SiO₂ substrates by covalent binding, physical adsorption and self-assembly techniques (alkane thiols on Au and PEG-silanes on SiO₂).
 - Immobilized albumin, IgG, fibrinogen, fibronectin, fibronectin adhesion peptide, and REDV-containing peptides on Au and Au-SiO₂ substrates using succinimidyl chemistry.
 - Immobilized annexin V and ovalbumin on gadolinium oxide nanoparticles.
- **Gene Expression and Gene Delivery:**
 - Cloned green fluorescence protein to human HeLa, rat glial tumor, murine macrophage and murine fibroblast cells for drug screening by fluorescence microscopy (model drugs: Etoposide, Methotrexate, and Cisplatin).
 - Delivered “Virus AAVlacZ” to micro-patterned fibroblast cells for gene therapy applications.
- **Bioconjugation:**
 - Conjugated various proteins and peptides with succinimidyl ester- and isothiocyanate-fluorescent probes: albumin, IgG, fibrinogen, fibronectin, annexinV.
 - Labeled human platelets and human endothelial cells with carboxyfluorescein diacetate succinimidyl ester probe.
- **Bio-impedance detection:** Measured the impedance of murine fibroblast adhered on chemically modified and unmodified gold electrodes.
- **Characterization Techniques:** Fourier transform infrared (FTIR) spectroscopy and spectromicroscopy (Grazing angle reflectance, Attenuated total reflectance (ATR), Transmission-KBr), Contact angle measurement, Time of flight-secondary ion mass spectroscopy (ToF-SIMS), Electron spectroscopy for chemical analysis (ESCA), Ellipsometry, Atomic force microscopy (AFM), Surface plasmon resonance spectroscopy, Fluorescence microscopy, Differential interference contrast reflectance (DIC) optical microscopy, Confocal fluorescence microscopy, Dialysis techniques for separations of conjugated proteins and peptides, Fluorometry, UV spectroscopy, Instron (tensile, compression, and flexural tests), Rockwell hardness, Metal polishing, Cold working, and fiber fastness measurement techniques.

1996-98 Dept. of Textile Chemistry Engineering, Isfahan University of Technology, Iran

Designed and trained different neural network algorithms to develop a new technique for color matching of fluorescent samples. Optimized 134 recipes for mono- and tri-chromatic dyeing of acrylic fabrics by cationic fluorescent dyestuffs and tested the accuracy of the network responses with 33 samples.

1994-95 Ciba-Geigy Inc. and Dept. of Textile Chemistry Engineering, Amirkabir University of Technology (Tehran Polytechnic), Iran

Optimized dyeing recipes for new mono-functional and bi-functional reactive dyes that had high percentages of exhaustions with minimal impacts on the environment. Studied the rate of exhaustion using spectrophotometric techniques and investigated the role of Alkaline leveling agents in the dyeing process.

TEACHING EXPERIENCE**2000-02 Dept. of Materials Science and Engineering, Seattle, WA**

- Lead teaching assistant:

- Trained teaching assistants to conduct lab experiments,
- Taught “Fundamentals of Materials Science MSE 170” course when needed,
- Managed MSE 170 course website,
- Managed ~ 20 projects per quarter (number of students up to 108 per quarter),
- Conducted Instron mechanical tests for the projects (minimum 3 tests per project),
- Held office hours, organized test forms, and proctored exams.

- Teaching assistant:

- Lab instructor for “Fundamental of Materials Science MSE 170” course,
- Graded lab reports and homework problems,
- Mentored students’ projects (~ 8 projects per quarter).

2000-04 Engineered Biomaterials Center (UWEB) and Dept. of Materials Science and Engineering, University of Washington, Seattle, WA

- Mentored 4 students in the Undergraduate Scholars in Research Program (USIRP) and 2 students in Research Experiences for Undergraduates Programs (REU).
- Mentored 4 students for their senior undergraduate thesis in biomaterials field.

INDUSTRIAL EXPERIENCE**1995-97 Faragir Baft-E-Balouch Textile Company, Iran**Responsible for technical procurement including foreign purchasing:

Managed high volumes of expensive chemical imports for the largest textile factory in the Middle East at the time. Verified and signed the reports provided by the quality control department of the factory, directly for Managing Director.

1994-95 Baft-E-Azadi Textile Factory, IranIntern at factory:

Conducted research on a newly established washing process for synthetic fiber production line and translated fabric printing/dyeing protocols from English to Farsi language.

REFEREED PUBLICATIONS

* 4 papers in preparation process

1. N. Saadatjou, M. Arami, and **M. Veisheh**. "Dyeing with Reactive Dyes". *Amirkabir Journal of Science and Technology*, 7(27); 241-250, **1995**.
2. **M. Veisheh**, Y. Zhang, K. Hinkely and M. Zhang. "Two-Dimensional Protein Micropatterning for Sensor Applications through Chemical Selectivity Technique". *Biomedical Microdevices*, 3(1); 43-49, **2001**.
3. **M. Veisheh**, H. M. Zareie and M. Zhang. "Highly Selective Protein Patterning on Gold-Silicon Substrates for Biosensor Applications". *Langmuir*, 18(17); 6671-6678, **2002**.
4. **M. Veisheh**, B.T. Wickes, D.G. Castner, and M. Zhang. "Guided Cell Patterning on Gold-Silicon Oxide Substrates by Surface Molecular Engineering," *Biomaterials*, 26(16); 3315-3324, **2004**.
5. S. Lan , **M. Veisheh**, and M. Zhang "Surface Modification of Silicon and Gold-Patterned Silicon Surfaces for Improved Biocompatibility and Cell Patterning Selectivity," *Biosensors and Bioelectronics*, in press, **2004**.

PROCEEDINGS

1. S. H. Amirshahi, F. Torkamani-Azar and **M. Veisheh**. "Application of Neural Network in Color Matching of Fluorescent Samples" 7th National Conference of Electrical Engineering in Iran, May **1999**.
2. **M. Veisheh**, Y. Zhang and M. Zhang. "Micro-Patterning of Individual Cell Growth for Cell-Based Sensor Applications," *BioMEMS and Biomedical Nanotechnology World 2000 Conference*, Sept. **2000**.

PRESENTATIONS

* presenting author is underlined

1. **M. Veisheh**, and M. Zhang. *UW Biomaterials Seminar*, Seattle, WA, Mar. **2002**.
2. **M. Veisheh**, and M. Zhang. *International Biomimetics Workshop- III on Nature of Protein/Inorganic Interfaces*, Friday Harbor, WA, Aug. **2002**.
3. **M. Veisheh**, and M. Zhang. *UW Biomaterials Seminar*, Seattle, WA, Nov. **2002**.
4. **M. Veisheh**, and M. Zhang. *Materials Research Society Conference*, Boston, MA, Dec. **2002**.
5. **M. Veisheh**, and M. Zhang. *Bio-Interface 2003*. Savannah, GA, Oct. **2003**.
6. **M. Veisheh**, B. Wickes, D. Castner, and M. Zhang. *Materials Research Society Conference*, Boston, MA, Dec. **2003**.
7. **M. Veisheh**, and M. Zhang. *UWEB Seminar Series*, Seattle, WA, Apr. **2004**.
8. **M. Veisheh**, and M. Zhang. *Nanotechnology Seminar Series*, Seattle, WA, Feb. **2004**.

POSTERS

* *presenting author is underlined*

1. **M. Veisheh**, S. Lan, G. Smith, M. H. Zareie and M. Zhang. *UWEB 5th Symposium: Biomaterials in 2001*, Seattle, WA, Aug. **2001**.
2. S. Lan, **M. Veisheh**, and M. Zhang. *Sixth UWEB Industry Symposium*, Seattle, WA, Jan. **2002**.
3. **M. Veisheh**, S. Lan, G. Smith, M. H. Zareie and M. Zhang. *First JIN Workshop*, Richland, WA, Feb. **2002**.
4. **M. Veisheh**, and M. Zhang. *National Science Foundation Site Visit at UWEB Center*, Seattle, WA, May **2002**.
5. B. Wickes, **M. Veisheh**, A. Tourovskaia, M. Zhang, A. Folch, and D.G. Castner. *Eighth International Conference on Chemometrics in Analytical Chemistry*, Seattle, WA, Sept. **2002**.
6. B. Wickes, **M. Veisheh**, A. Tourovskaia, M. Zhang, A. Folch and D.G. Castner. *American Vacuum Society 49th International Symposium*, Denver, CO, Nov. **2002**.
7. **M. Veisheh**, S. Lan, and M. Zhang. *UWEB 7th Symposium: Biomaterials in 2003*, Seattle, WA, Aug. **2003**.
8. **M. Veisheh**, B. Wickes, D.G. Castner, and M. Zhang. *Bio-Interface 2003*. Savannah, GA, Oct. **2003**.

NON-REFEREED PUBLICATIONS

1. C. Nojiri, **M. Veisheh**, J. Shelton, and M. Zhang. "Characterization of Covalently Immobilized Bovine Serum Albumin on Gold Patterned Silicon Substrates," *Journal of Undergraduate Research in Bioengineering*, **2003**.
2. B. Flores IV, **M. Veisheh**, and M. Zhang. "Cell Patterning on Silicon-Gold Chips Using a Highly Selective Protein Patterning Technique," *Journal of Undergraduate Research in Engineering*, **2002**.
3. S. Lan, **M. Veisheh**, and M. Zhang. "Biocompatibility of Surface-Modified Silicon for Cell-Based Biosensor Applications," *Journal of Undergraduate Research in Engineering*, **2001**.
4. G. Smith, S. Lan, **M. Veisheh**, and M. Zhang. "Immobilization of Proteins onto Solid Gold Surfaces via Physical Adsorption and Covalent Bonding", *Journal of Undergraduate Research in Engineering*, **2001**.

ACTIVITIES**Outreach:**

- Nanotechnology K-12 Disabilities, Opportunities, Internetworking and Technology: presented an introduction to nano-biotechnology and demonstrated various nano-products for students.
- UWEB K-12 and Community College Classroom Visits: visited 4 classrooms in the Seattle area to present an introduction to bioengineering followed by a hands-on design challenge and demonstration of implantable biomaterials.

- Materials Camp USA West 2003 – ASM Materials Education Foundation: acted as mentor for group of five high school students to “characterize coronary catheters”. Also assisted other groups for various materials characterizations.
- MSE K-12 Schools and Community Colleges Visitation Program: introduced and discussed various materials and products made at Materials Science and Engineering department to visiting students.
- Engineering Open House Presentation: provided demonstrations, lectures, and hands-on activities in Materials Science and Engineering field for students of all ages.

Member:

- Nanotech Student Association (NSA)
- Materials Research Society (MRS)
- ASM Materials Education Foundation/ASM International
- UW Engineered Biomaterials (UWEB)
- Women in Science and Engineering (WISE)

Sport Competitions:

- Swimming champion among university league of the country for 6 years
- Captain of swimming team for 2 years
- Swimming competition referee
- Lifeguard

Personal interests:

Playing guitar, traveling, sports (swimming, tennis and aerobics), movies, and classical music.

REFERENCES

Available upon request.